The three books the titles of which head this review are typical of the three classes of men who have made the electrical industry. Mr. Whetham's of the seekers after truth who are always asking for more light and have discovered all the fundamental principles on which the industry is based, Messrs. Ashe and Keiley's of the pioneers who have developed the practical possibilities of these principles, and "Modern Electric Practice" of the great majority who are content to follow where others lead but whose united efforts have placed at the disposal of all mankind the forces latent in the philosopher's jar. MAURICE SOLOMON.

HYGIENE AT SCHOOL.

Text-book of Hygiene based on Physiology for the use of School Teachers. By A. Watt Smyth. Pp. xvi+256. (London: Simpkin, Marshall and Co., Ltd.) Price 6*s*.

MRS. WATT SMYTH rightly says in her preface that

> "Physiology is the science of the action of the body in health, hygiene the practical application of this science; it is obviously impossible to understand the laws of hygiene without a knowledge of the fundamental principles of physiology."

She has set herself the task of providing a text-book of hygiene founded upon physiology, for the use of teachers, in order that they may comprehend the hygienic needs of the pupils committed to their charge. Hitherto the books written with this object (and there are several) have either been good as text-books of elementary physiology and bad as text-books of elementary hygiene, or *vice versâ*; and Mrs. Watt Smyth is to be congratulated upon having brought these two subjects, which are so intimately associated with each other, into a fairly satisfactory relationship, and upon having dealt with each in a very commendable manner. It must be said, however, that the physiological matter of the book is the better, and that in many instances the hygienic matter could have been presented in greater fulness of detail with advantage. The space given to physiology far exceeds that devoted to hygiene, and while the demands of the former subject upon space are necessarily somewhat greater, there can be no two opinions that the physiology in many respects is too elaborate for the purpose to which this book is dedicated. Some non-essential matter is included; for instance, a description is given of the ethmoid bone, the number of bones it articulates with, and the time when ossification is complete; the number of separate centres of ossification is also given of other cranial bones; the minute structure of the salivary glands is entered into with unnecessary fulness, for the teacher is informed that

> "the secreting cells of the salivary glands are of two main types, according as the secretion of the gland is mainly serous or albuminous (Parotid), mainly mucous (sub-lingual) or both (sub-maxillary). In a gland that has not been recently secreting, the mucous secreting cells, which are round or oval, are distended with a clear substance, mucigen, from which mucus is formed when the gland becomes active. The cells of the glands which yield an albuminous secretion are cubical and almost fill up the acini. Their protoplasm is full of dark granules before secretion occurs; when it begins, the granules diminish in number and finally almost completely disappear."

These instances are referred to as illustrations of a certain lack of appreciation, which is evident here and there, of what is essential and what is not; for it is impossible to see what practical application can be claimed of the knowledge of the above facts. The illustrations and diagrams, moreover, are anatomical and histological. There is no single illustration of any form of sanitary apparatus or appliance, and these matters are referred to in the text often in such a cursory manner that the reader would find it impossible to form a satisfactory conception of their true nature.

Mrs. Watt Smyth deals with each subject on an excellent plan. First she gives a brief account of the physiology of the subject discussed (with special reference to any notable feature of these physiological processes in childhood), and then she proceeds to deal with the hygienic principles and practices which rest upon these foundations. Her scheme is well illustrated in the chapter on respiration and air; the nose, larynx, trachea, and lungs are first described, then the mechanism of respiration is explained, next the constitution of the air prior and subsequent to respiration is set out, and then there follows the consideration of the problems of ventilation and heating, and the evil consequences which result when these provisions are insufficient or faulty.

The other chapters of the book fairly cover the necessary ground, and the chapters upon the special senses and the muscular system (the latter including a syllabus of physical exercises based on the Swedish system) are very complete.

In conclusion, reference should be made to the great care which has been exercised in the preparation of this work. The facts set out are entirely accurate and the opinions expressed are sound, without exception. The author acknowledges her indebtedness for information and counsel from such authorities as Dr. Dawson Williams, Dr. James Kerr, and Miss Turner.

REGENERATION IN ROOTS.

Studien über die Regeneration. By Prof. B. Němec. Pp. 387; with 180 figures in the text. (Berlin: Gebr. Borntraeger, 1905.) Price 9.50 marks.

IN this somewhat bulky volume the author describes and discusses at some length the result of his numerous experiments on the regenerative processes that occur in wounded roots.

It is well known that if the tip be removed from a growing root a new apex is commonly differentiated, growth in length commencing once more when the new tip has become completely formed. The objects of Dr. Němec's investigation have been to endeavour to throw some light on the nature of the process of regeneration itself, the causes that initiate and determine its occurrence, and the meaning of the physiological events that are associated with it. The

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methods adopted were extremely simple. The tips of growing roots, chiefly of seedlings, were injured in various ways by making incisions into the region about the apex, and the reactions that ensued were carefully followed and compared.

It was found, in confirmation and extension of the less complete observations of Prantl and of Simon, that the roots of ferns never truly regenerate themselves as do those of flowering plants. Possibly the difference is to be attributed to the more definite concentration of formative protoplasm in the apical cell of the former, as contrasted with its greater extension as layers in the roots of the latter. At any rate, no regeneration occurs in the roots of ferns, although some attempts at healing the actual wound may be made.

The case is different with the roots of phanerogams, although in them also the conditions of regeneration are more limited than might have been anticipated. In the first place, no union of the halves of longitudinally cut roots took place; the damaged apex was either replaced by a new one on either side of the slit or else the regeneration was confined to one half.

An annular incision made just behind the tip of the root into the cortex and extending as the endodermis fails to give the stimulus requisite to produce a fresh apex. Healing of the wound is more or less in evidence, but the original apex continues to function, and to supply cells for the further growth and elongation of the root. But if the knife has passed through the next layer, the pericycle, regenerative phenomena at once set in. A new apex, with all the complicated layers, is formed just behind (*i.e.* proximally to) the wound, and it is especially interesting to discover that the statolith starch now disappears from the original tip, to be transferred to, or at any rate to reappear in, the new one.

Lateral incisions are ineffective to bring about the differentiation of a new apex unless the slit has severed at least half the circumference of the pericycle. If this be done regeneration takes place, with the concomitant appearance of statolith starch in the new organ. All the experiments made on the roots go to emphasise the great importance of the pericycle in connection with regenerative processes, although it is not from this layer itself that the new tip is differentiated, but from the indifferent plerome cells within it. The damage done to the pericycle appears to act as an interruption of the coordinative relations between the various parts of the embryonic region as a whole. When this coordination is thus interrupted the capacity of giving rise to entire organs that is resident in the embryonic protoplasm asserts itself, and the new formation thus appears. We know as a matter of fact that the pericycle retains the embryonic condition until relatively late, since from it arise the normally produced lateral roots. Of course, the processes underlying the regenerative processes are by no means cleared up by the experiments indicated above, but at any rate certain definite facts have been ascertained, and further lines of profitable investigation readily suggest themselves.

Comparatively few anomalous cellular effects were observed. In the exceptional case of one fern root, however, the nuclei of the healing (not regenerative) cells exhibited irregularities both in their modes of division and in the number of their chromosomes which were commonly excessive. Multinucleate cells were also observed in the plerome of a wounded root of Ricinus, but they apparently took no part in the actual regenerative processes.

The book as a whole forms an important contribution to the literature of regeneration, its chief merit perhaps lying in the numerous problems it suggests for future investigation. It contains a bibliography that should be useful, but it would have been materially improved by the addition of a good index.

OUR BOOK SHELF.

Heredity. By C. W. Saleeby, M.D. Pp. 118. (London and Edinburgh: T. C. and E. C. Jack, n.d.) Price 1*s.* net.

The appearance of a little shilling book on heredity is almost startling, when we consider the difficulty of the subject and the relative youth of its exact study. That a book like this should be possible indicates that considerable progress has been made in recent years. Was it not Leibnitz who said, "The more a science advances, the more it becomes concentrated in little books"? But it indicates also a noteworthy skill on the author's part. Without attempting to slur over difficult themes, *e.g.* Mendelism, as if they were easy, he has given us a clear and interesting exposition, which will be widely appreciated. It is a wonderful *multum in parvo*, dealing lucidly, for instance, with the contrast between hereditary resemblance and variation, between the germ-plasm and the body, between germinal variations and somatic modifications, between inherited nature and the results of nurture, between inborn and congenital characters, and so on. Even to have made these distinctions clear, so that they may be understanded of the people, is an achievement. As was natural in a book of this kind, the author takes up an eclectic position, and quotes freely from various writers—from one about ten times. He is inclined to allow that there is a limited transmission of "acquirements" or modifications, but the only instance we have found is an inept one—that bacteria may transmit an exaltation of their virulence. He agrees with Dr. Archdall Reid on many points, *e.g.* that amphimixis never produces more than regressive variations, but does not think that this author satisfactorily accounts for the origin of spontaneous variations. He has the same complaint to make of Weismann, but in regard to a view which that progressive biologist no longer holds, as, indeed, the author seems to know (p. 54). We may also note that even in "The Germ-Plasm" Weismann did not teach that "parthenogenetic species cannot vary"; in fact, he made experiments showing reversion in parthenogenetic generations of Cypris. There is a useful chapter on "physical degeneration," but we do not understand the author when he says that those who believe in progressive degeneration "have it incumbent upon them to demonstrate either the falsity or the suspension of the law of natural selection." Surely the many "degenerate" animals that we know have not become what they are without the help of selection. Another point that we do not understand is how the fact that "one-half of the nuclear chromatin of each gamete is thrown aside prior to the fusion of the two nuclei," "obviously

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